Pixel ToT precision study

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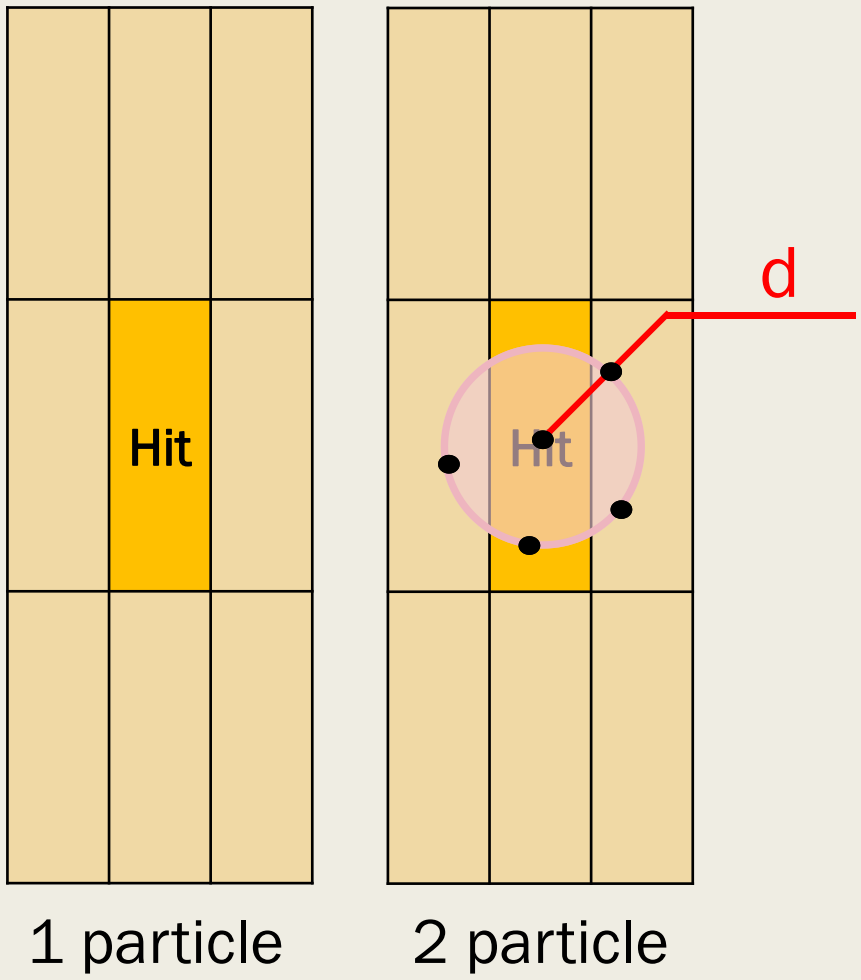
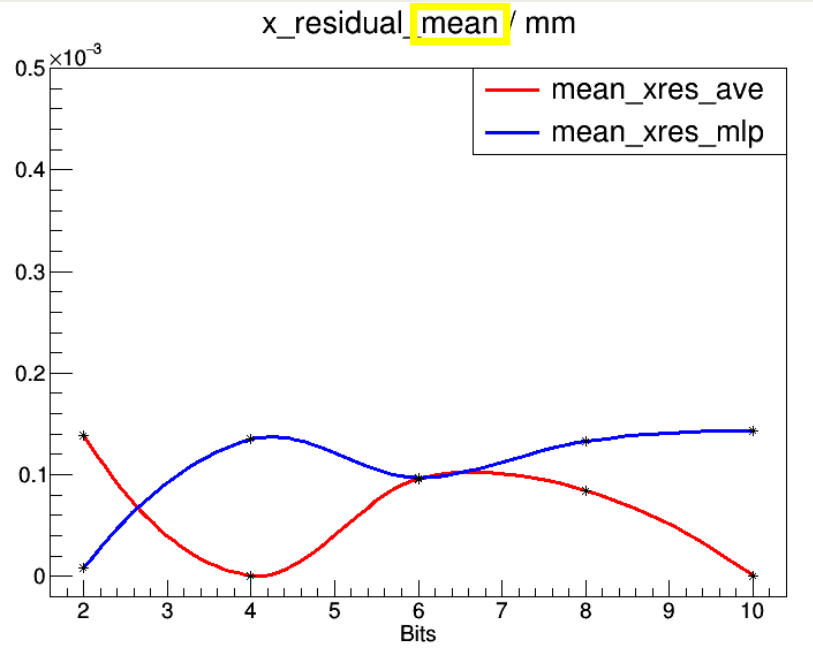
How the number of ToT bit influence the reconstruction ability?

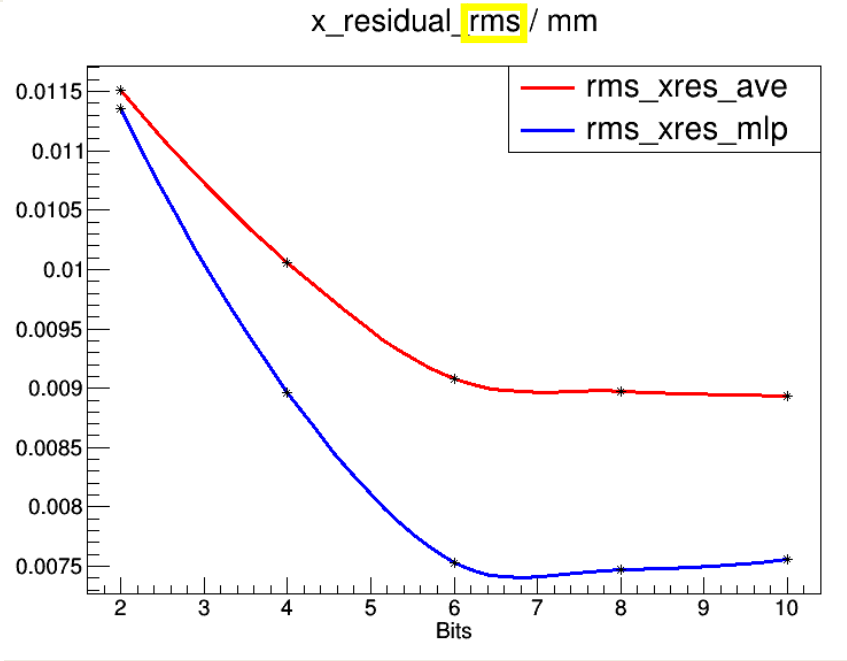
- 1 particle case
  - *Randomly shot in the middle pixel (uniform distribution)*
  - *May diffuse into nearby pixels*
- 2 particles case
  - *1st particle randomly in the middle pixel*
  - *2nd particle has a fixed distance (d) to the 1st*



1 particle case

- X residual (X_{det} - X_{true}) Pixel_X = 50 um
  - *Charge weighted average -------- ave*
  - *Artificial neutral network regression --------- mlp*

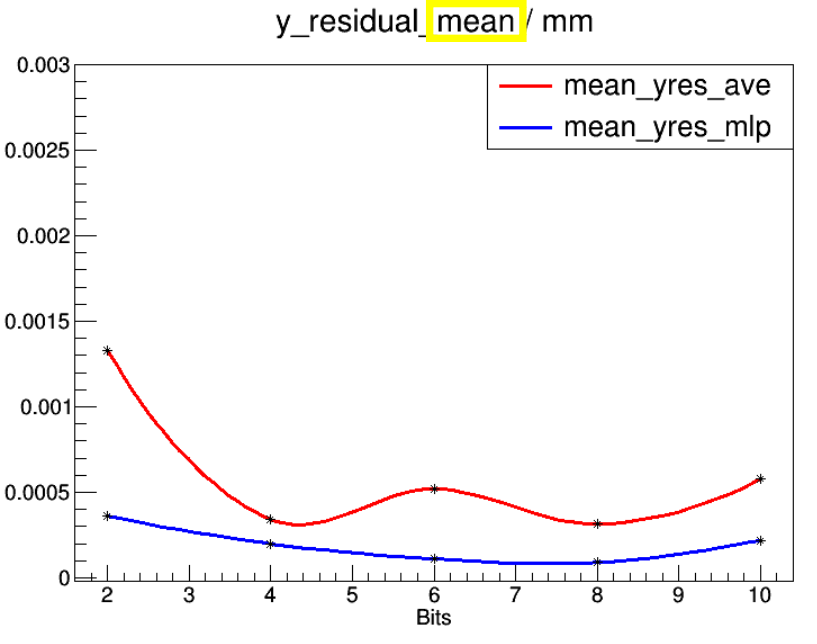


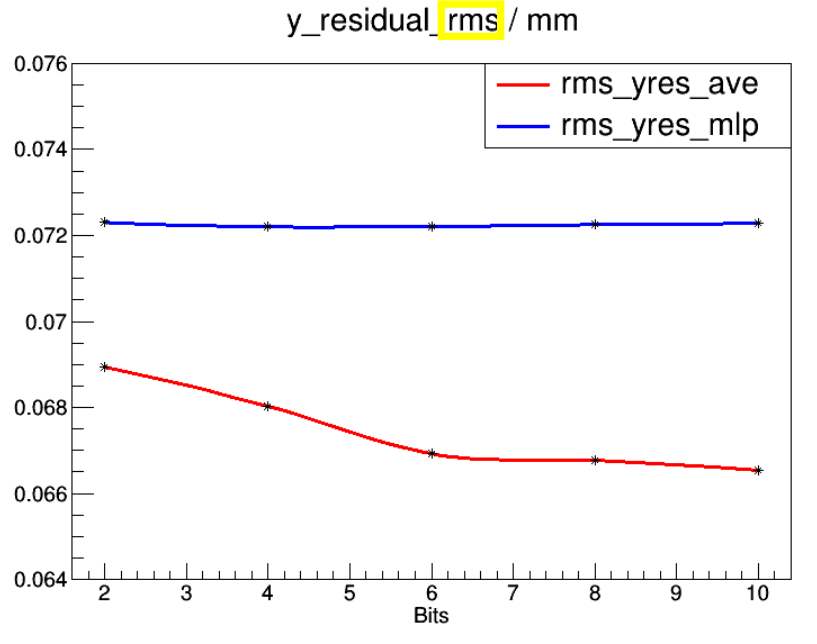


1 particle case

- Y residual (Y_{det} - Y_{true})
  - *Charge weighted average*
  - *Artificial neutral network regression*

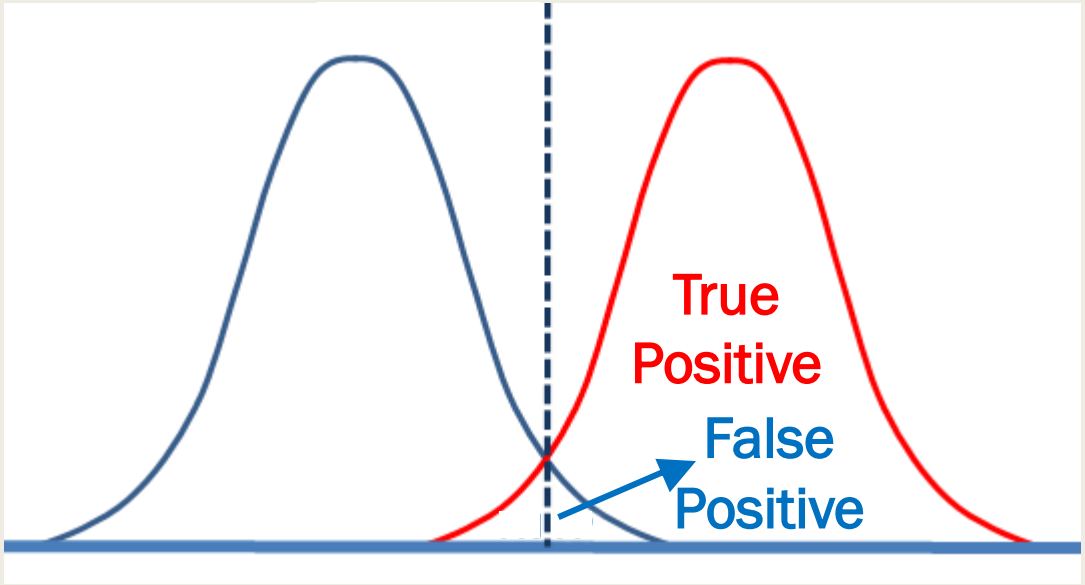
Pixel_Y = 250 um





2 particle case

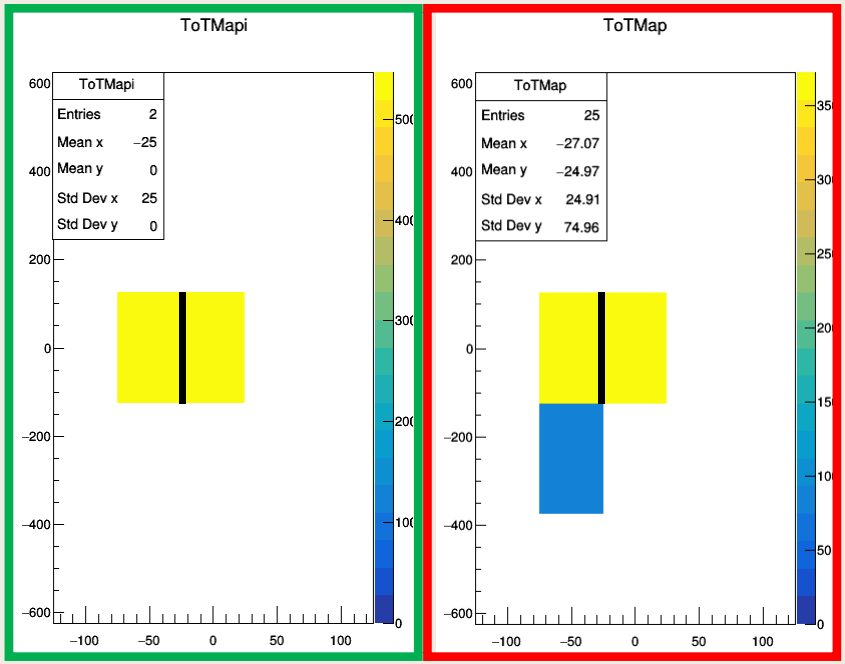
- Generate dataset with 1 and 2 particle events and classify them with neutral network



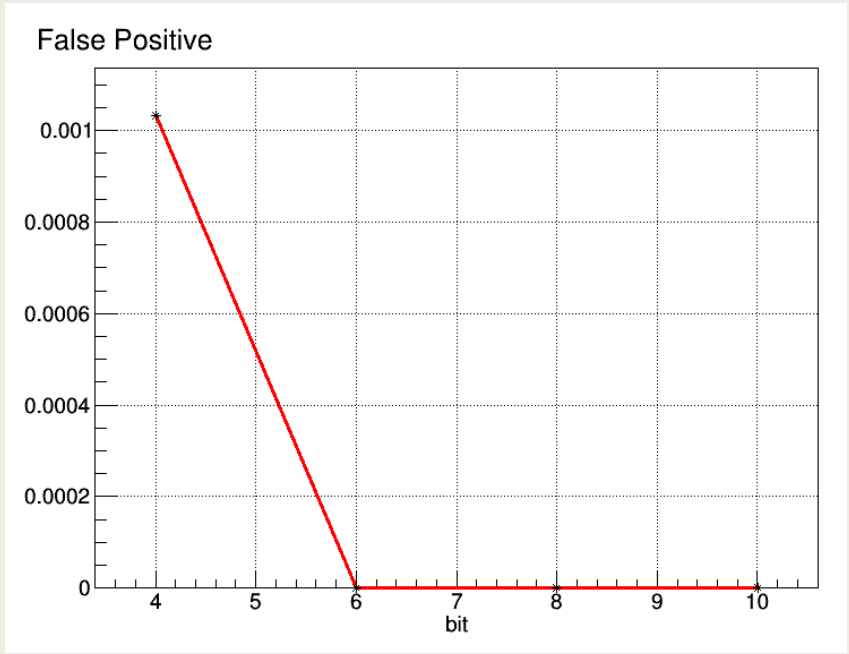
- Given a constant True Positive (95%), cut is chosen
- Calculate the False Positive and compare

2 particle case

- 2 particles are hit in two nearby pixels (Uniformly distributed in each pixel)
- 2 particles diffuse independently

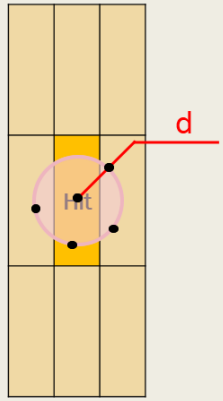


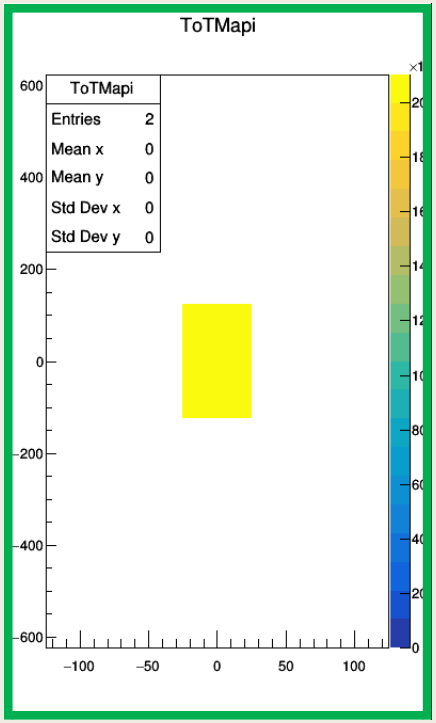
before diffuse after diffuse

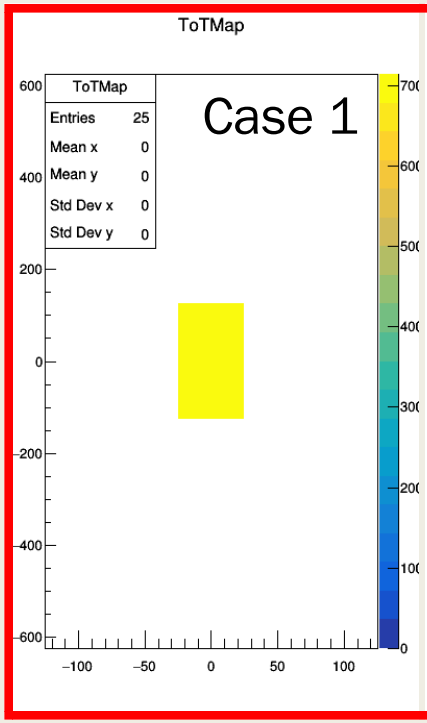


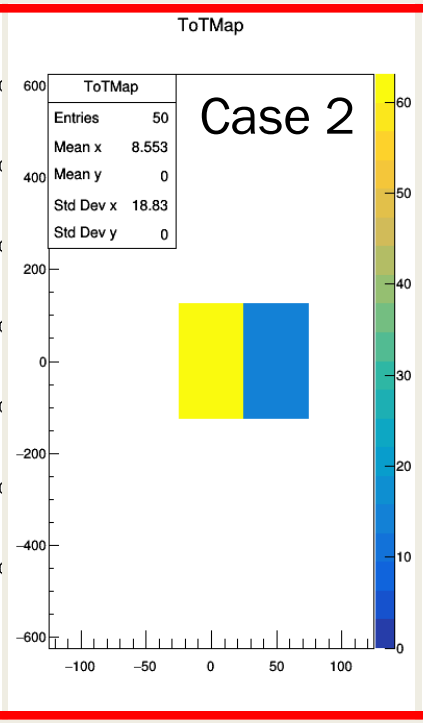
2 particle case

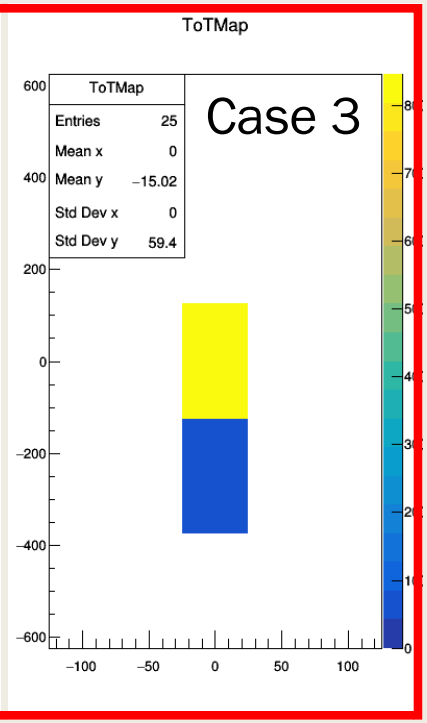
- Bit = 2, 4, 6, 8, 10
- Distance = 25 um











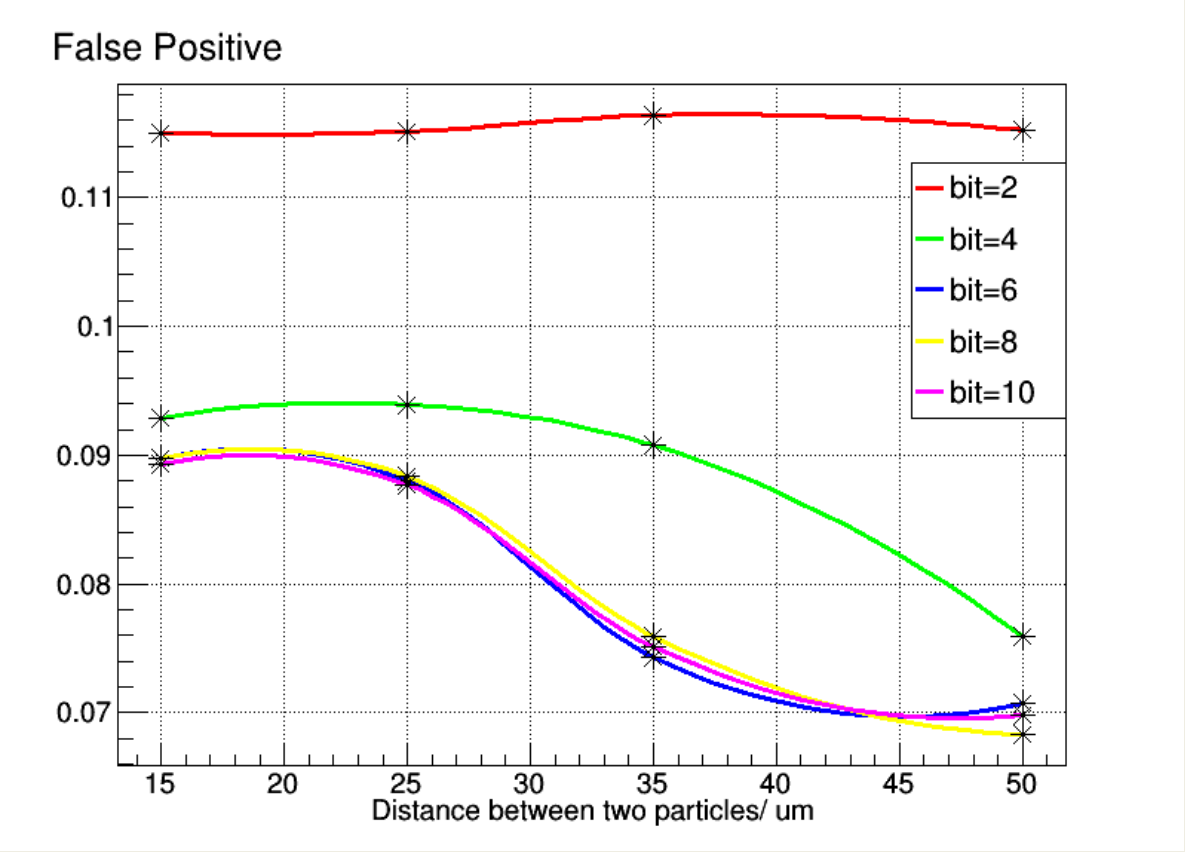
before diffuse

after diffuse

2 particle case

No radiation effect !

- False Positive at distance 15, 25, 35, 50 um.



Next step …

- Learn and test more with artificial neutral networks
- Regression of the exact position
- More particles conditions

Thank you!